IN THE SPECIFICATION:

Please amend the paragraph starting at page 5, line 6 as follows:

--It is found from the survey of this problem that ~~the~~ photographic fog occurs due to a reduction of the toner charge amount. That is, the triboelectrical-charging capability of the carrier in the developer is extremely degraded before the number of printed sheets becomes ~~a~~ the predicted number of sheets upon expiration of the life of the carrier.--.

Please amend the paragraph starting at page 5, line 13 as follows:

--The life of the carrier in the developer (use amount) is also influenced by the ~~from a~~ toner use amount. There is a difference between the life conventionally determined based on the ~~number of shares to~~ amount of the carrier in the developer, i.e., the number of revolutions of the developing sleeve or the number of printed sheets indicating the number of revolutions of the screw to stir the developer, and the actual life of the carrier in the developer.--.

Please amend the paragraph starting at page 7, line 11 as follows:

--Fig. 1 is a ~~control~~ schematic block diagram according to a first embodiment of the present invention;--

Please amend the paragraph starting at page 9, line 3 as follows:

--In Fig. 2, the endless intermediate transfer belt 9, put on a drive roller 9e, a tension roller 9f and a pair of secondary transfer rollers 10, 10a, ~~is~~ are rotated in an arrow direction in the figure.

Please amend the paragraph starting at page 9, line 14 as follows:

In the P-CRG 7, numeral 1 denotes a rotary drum type electrophotographic photo conductor (electrostatic drum) as an image holder. The electrostatic drum 1 is an organic photo conductor (OPC) drum having an outer diameter of 50 mm, which is rotated in the arrow-indicated clockwise direction at a process speed (peripheral velocity) of 100 mm/sec about its center axis. In the electrostatic drum 1, an under coating layer to improve adhesivity of an upper layer while suppressing ~~suppress~~ light interference, a ~~photocharge~~ photo-charge generation layer, and a charge transfer layer (with a thickness of 20 μm) are sequentially formed on the surface of an aluminum cylinder (conductive drum base body).--.

Please amend the paragraph starting at page 9, line 27 and ending at page 10, line 13 as follows:

--During the ~~At a~~ charging process, a predetermined-conditioned voltage is applied to a charging roller 2 as a contact charger, thereby uniformly charging the surface of the electrostatic drum 1 ~~is uniformly charged~~ with a negative polarity. In the charging roller 2, having a width of 320 mm, a foam sponge layer, a resist layer as an intermediate layer, and a surface layer as a protective layer, are formed outside a cored bar (support member). In the charging roller 2, a stainless-steel bar having a diameter of 6 mm is used as a cored bar 2a, and the surface layer is formed with fluorine-contained resin including suspension of carbon. The charging roller has an outer diameter of 14 mm, and has a roller resistance of 104Ω to 107Ω--.

Please amend the paragraph starting at page 10, line 14 as follows:

--The charging roller 2 holds both ends of the cored bar 2a respectively rotatably with bearing members, and presses the cored bar against the surface of the electrostatic drum 1 with a predetermined pressing force. The charging roller 2 rotates in accordance with the rotation of the electrostatic drum 1. A predetermined oscillation voltage (bias voltage Vdc + Vac) obtained by superposing an alternating current voltage at a frequency f with a direct current voltage, is applied from the power source (not shown) ~~20~~ via the cored bar 2a to the charging roller 2, then the peripheral surface of the rotating electrostatic drum 1 is charged to a predetermined potential.--.

Please amend the paragraph starting at page 12, line 11, as follows:

--The developing unit 4 is a 2-component contact developing unit (2-component magnetic brush developing device). Reference numeral ~~Numeral~~ 40 denotes a developer container; and reference numeral 41 denotes ~~41,~~ a non-magnetic developing sleeve having a magnet roller (not shown) fixed inside. The developing sleeve 41 is rotatably provided in the developer container 40 with a part of its outer peripheral surface exposed to outside. Reference numeral ~~Numeral~~ 42 denotes a developer regulating blade; reference numeral 46 denotes ~~46,~~ 2-component developer as a mixture of toner and magnetic carrier contained in the developer container 40; reference numerals 43 and 44 denote ~~43 and 44,~~ developer stirring members (screws) provided on the bottom side in the developer container 40; reference numeral 47 denotes ~~47,~~ a toner supply port; and reference numeral 48 denotes ~~48,~~ a partition wall. The developer regulating blade 42, provided away from the developing sleeve 41 with a predetermined interval, forms a thin layer of

developer on the developing sleeve 41 in accordance with the rotation of the developing sleeve 41.--.

Please amend the paragraph starting at page 13, line 2 as follows:

--The developing sleeve 41 is provided to be opposite to the electrostatic drum 1 in the proximity thereof with a constant minimum distance to the electrostatic drum 1 (S-Dgap) of 350 μm. A developing portion 13 is ~~a~~ <u>the</u> portion between ~~opposing~~ electrostatic drum 1 and the developing sleeve 41 <u>where these two elements oppose each other</u>. In the developing portion, the developing sleeve 41 is rotated in an opposite direction to a forward direction of the electrostatic drum 1. In the developing portion 13, the thin layer of developer on the developing sleeve 41 comes into contact with the surface of the electrostatic drum 1, and appropriately slide-rubs the surface of the electrostatic drum. A predetermined developing bias is applied from a power source (not shown) to the developing sleeve 41. In the present embodiment, the developing bias to the developing sleeve 41 is ~~a~~ <u>an</u> oscillation voltage obtained by superposing a direct current voltage (Vdc) with an alternating current voltage (Vac). More particularly, it is a oscillation voltage obtained by superposing the direct current voltage Vdc = -350 V, the alternating current voltage Vac = 1800 V, and a frequency = 2300 Hz.--.

Please amend the paragraph starting at page 13, line 24 as follows:

--In the developer, coated as a thin layer on the surface of the rotating developing sleeve 41 and transferred to the developing portion, toner is selectively attached to the surface of the electrostatic drum 1 in correspondence with the electrostatic latent image with a magnetic field

by the developing bias, thereby developing the electrostatic latent image ~~is developed~~ as a toner image. In the present embodiment, the toner is attached to exposed bright parts on the surface of the electrostatic drum 1 and thus the electrostatic latent image is reverse developed ~~invert-developed~~. --.

Please amend the paragraph starting at page 14, line 8 as follows:

--The thin layer of developer on the developing sleeve 41 having passed through the developing portion is returned to a developer storage part in the developer container 40 in accordance with the subsequent rotation of the developing sleeve 41.--.

Please amend the paragraph starting at page 18, line 10 as follows:

--The T-CRG 5 and the P-CRG 7 are provided with storage units 20 and 21 for providing information on the life of the T-CRG 5 and the P-CRG7 or information on the time of replacement to a user. In Fig. 1, the storage units are provided in back positions of the T-CRG 5 and the P-CRG 7.--,

Please amend the paragraph starting at page 18, line 16 as follows:

--As the storage units 20 and 21, any storage device can be used as long as it rewritably holds signal information. For example, electrical storage means, such as a RAM or a rewritable ROM, magnetic storage means, such as a magnetic recording medium, a magnetic bubble memory or a magneto-optical memory, may be used.--.

Please amend the paragraph starting at page 19, line 14 as follows:

--The FeRAM has storage areas a1 to a3 for storing information on the number of print sheets, information on the toner supply amount, threshold value information for a determination of the time of replacement of T-CRG 5 or P-CRG 7 and the like. A control signal is transmitted from the CPU 26 via the reader/writer 25 and the antenna 23 of the image forming apparatus main body to the antenna 23 on the cartridge side, and the information is written/read into/from the storage areas of the storage units 20 and 21. Note that in Fig. 1, the storage units 20 and 21 are accessed via one reader/writer 25 and one antenna 23, however, the reader/writer and the antenna may be respectively provided in the storage units 20 and 21.--.

Please amend the paragraph starting at page 20, line 8 as follows:

--In the present embodiment, when the toner supply screw 51 rotates once, toner of 200 mg is supplied to the developing unit 4. As described above, if it is determined based on the result of detection by the toner sensor 45 that the toner density is low, a signal requiring toner supply is sent to the CPU 26. The CPU 26 receives the signal, and rotates the driving unit 70, such as a motor, for the toner supply screw 51, thus supplying ~~supplies~~ toner from the T-CRG 5

to the P-CRG 7. At this time, in the present embodiment, the number of revolutions of the driving motor is detected by an encoder (not shown), and the use amount of the toner supply screw 51 is obtained by integrating the number of revolutions. Then, the toner supply amount is determined based on the use amount of the screw 51.--.

Please amend the paragraph starting at page 20, line 23 as follows:

--The CPU 26 transmits the number of revolutions of the toner supply screw 51 via the reader/writer 25 and the antenna 23 (Fig. 1) on the image forming apparatus main body side to the reader/writer 25 for the T-CRG 5, to write the data on the FeRAM 20 of the T-CRG 5. In the present embodiment, as the relation between the number of revolutions of the screw and the toner use amount is linear, the remaining toner amount in the T-CRG 5 is detected based on the number of revolutions of the screw. More particularly, in the T-CRG 5, the amount of filled toner is 500 g. Mathematically, if the toner supply screw 51 is rotated 2500 times, the amount of remaining toner becomes zero. Actually, toner of about 20 g remains in dead space in the T-CRG 5, so that the amount of toner becomes zero if the toner supply screw is rotated 2400 times. Accordingly, when the data on the number of revolutions stored in the FeRAM 20 becomes 2400, it is determined that the life of the T-CRG 5 is expired and the user is notified that the toner is exhausted ~~exhaustion of toner is notified to the user~~.--.

Please amend the paragraph starting at page 21, line 15 as follows:

-Note that in Fig. 1, the driving unit 70 which rotates the toner supply screw 51, also rotates the developing sleeve 41 and the screws 43 and 44. Further, upon image formation, a driving unit 71 (such as a motor) rotates the electrostatic drum 1 and the charging roller 2. The driving unit 71 is separately provided from the driving unit 70, which ~~to which~~ drives the toner supply screw 51, however, it may be arranged such that those elements are driven by a single driving unit.

Please amend the paragraph starting at page 21, line 26 as follows:

--Fig. 5 shows the result of a survey regarding the number of ~~print~~ sheets that must be printed to obtain the ~~upon~~ occurrence of ~~a~~ the "photographic fog" phenomenon, i.e., the threshold number of print sheets of the developing unit 4 at which "photographic fog" occurs, thereby indicating ~~as~~ the expiration of the life of the developing unit 4, for the purpose of checking the influence of ~~a~~ the printing percentage (and the toner use amount) upon the life of the carrier in the developer in the developing unit 4, by actually performing print operations with various printing percentages in an 23 °C/60% RH environment.--.

Please amend the paragraph starting at page 22, line 9 as follows:

--In a case where an image with a printing percentage of 5% is continuously printed and in a case an image with a printing percentage of 10% is continuously printed, the number of printed sheets that must be produced for ~~upon occurrence of the~~ photographic fog to occur is 50,000 in both cases, i.e., the life of the carrier expires when this number of printed sheets ~~are~~ is

obtained, regardless of printing percentage. Further, in the case of printing with percentages 20%, 30%, 40% and 50%, the number of printed sheets that must be produced for ~~upon occurrence of the~~ photographic fog to occur is reduced in accordance with the increment in printing percentage. It is apparent from Fig. 5 that in the case of a high printing percentage, one factor that influences the life of the carrier is ~~an~~ the integrated toner use amount. Fig. 5 shows the toner use amounts before the expiration of the life of the carrier at the respective printing percentages. At the printing percentages of 20%, 30%, 40% and 50%, when the integrated toner use amount becomes 4000 to 4250 g, the life of the carrier expires. That is, at a 20% or higher printing percentage, the life of the carrier expires when the integrated toner use amount exceeds a predetermined value.--.

Please amend the paragraph starting at page 23, line 14 as follows:

--(2) The surface of the carrier is covered with a melt additive agent in the toner, and the triboelectrical-charging capability is degraded. (The additive agent used in the present embodiment is silica, which has ~~basically~~ usually the same negative polarity as that of the toner, ~~is in~~ but here has a reverse polarity ~~negative direction~~ with respect to the toner. When the silica is fused to the surface of the carrier, the toner is charged to a positive polarity.)--.

Please amend the paragraph starting at page 26, line 16 as follows:

--At step S100, the determination control is started, then at step S101, information on the operation amount of the developer holder, and the toner use amount information are read by the CPU 26 from the storage areas of the FeRAM 21 via the reader/writer 25 and the antenna 23. In the present embodiment, as the information on the operation amount of the developer holder, the number of printed sheets is read, and as the toner use amount information, ~~a~~ the period of rotation of the toner supply screw 51 as the driving amount is read. Next, image formation is performed, and ~~thereby~~ the number of printed sheets as the information on the operation amount of the developer holder is counted, and integrated with the read value in step S102. At the same time, the period of rotation of the toner supply screw 51 is integrated with the read value at step S103. At step S104, it is determined whether the integrated count value of the information on the operation amount of the developer holder (the integrated count value of the number of printed sheets) is greater than a predetermined threshold value (the above 50,000) or whether the integrated count value of the toner use amount information (the integrated count value of the toner supply screw) is greater than a predetermined threshold value (the above toner amount 4000). If one of the integrated count values is greater than the predetermined threshold value, it is determined at step S105 that it is time to replace the developing unit, and a message notifying the user that the developing unit must be replaced or the like is outputted to a display unit (not shown). Then the process proceeds to step S107, at which the process ends.--.

Please amend the paragraph starting at page 27, line 26, as follows:

--As a result, regardless of the printing percentage, the expiration of the life of the carrier in the developer, i.e., the expiration of the life or the time of replacement of the developing unit 4 can be accurately detected.--.

Please amend the paragraph stating at page 28, line 22 as follows:

--Further, in the present embodiment, the number of printed sheets is employed for determining the amount of the carrier ~~determination of share (use amount) to the carrier~~ in the developer (use amount). However, the determination may be made by detecting the number of revolutions of the developing sleeve 41 or the number of revolutions of the screws 43 and 44.--.

Please amend the paragraph starting at page 29, line 13 as follows:

--Further, in the present embodiment, the P-CRG 7 including the electrostatic drum 1, the developing unit 4, the charging roller 2 and the cleaning blade 5 is a removable cartridge. However, ~~cartridge, however,~~ it may be arranged such that only the developing unit 4 is removable ~~replicable~~. In this case, the developing unit 4 is provided with an FeRAM, and the determination of the expiration of life or the time ~~or~~ of replacement of the developing unit is similarly performed.--.

Please amend the paragraph starting at page 29, line 21 as follows:

--In the above arrangement, the life of the developing unit, i.e., the use amount of the carrier in the developer can be more accurately detected. Further, the user can be notified of the accurate time of replacement ~~can be accurately notified to the user~~ so as to use the developing unit completely ~~to the full~~ while preventing the occurrence of photographic fog.--

Please amend the paragraph starting at page 30, line 1 as follows:

--In this embodiment, the electrostatic drum, the charging roller, the cleaner and the developing unit are integrated as the P-CRG, as in the case of the first embodiment. However, ~~embodiment, however,~~ the determination of the end of the life of the cartridge is different.--.

Please amend the paragraph starting at page 30, line 7 as follows:

--In the first embodiment, only the life of the developing unit is determined as the determination of the end of the life of the P-CRG. On ~~P-CRG, on~~ the other hand, in the present embodiment, the life of the electrostatic drum is also determined, and when one of the life of the developing unit and that of the electrostatic drum has expired, it is determined that the life of the P-CRG has expired.--.

Please amend the paragraph starting at page 30, line 14 as follows:

--For the determination of life of the electrostatic drum, a period of rotation of the electrostatic drum and a period of AC bias application to the charging roller are used as

parameters, since ~~the~~ both ~~of~~ the number of revolutions of the electrostatic drum and the period of AC bias application to the charging roller influence the abrasion of the electrostatic drum.--.

Please amend the paragraph starting at page 31, line 1 as follows:

--Then, this life determination value Xend is previously stored on the FeRAM provided in the P-CRG, and during actual printing, the Tac and Td values are stored onto the FeRAM. The CPU reads the stored values and compares them with the ~~determination~~ determined value Xend, thereby determining ~~determines~~ the life of the P-CRG.--.